Two new *Chrysozephyrus* (Lycaenidae) species from Formosa (Taiwan)

(The nineth study on the Formosan Rhopalocera collaborated by S. MURAYAMA and T. SHIMONOYA)

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The *Chrysozephyrus* group occuring in the northern as well as middle mountainous areas of Formosa, includes some extremely similar species each other in appearance, especially *C. mushaellus* and *esakii* are so full of individual variety in their colour, marking, size, etc, that we have been studying on the limits of their variety and the confusion of some extremely resembling species. In consequence of our study, we have already published two new species, *Chrysozephyrus yuchingkinus*, in TYO TŌ GA, Vol. 11, No. 2, 1960, and *Chrysozephyrus hsuehshanus*, in Tôhôku Konchu Kenkyu, Vol. 4, No. 2, p. 22-23, pl. 3, 1969, and further, in this time, two new *Chrysozephyrus* species are added to our science.

We are greatly indebted to Mr. C. K. Yu at Puli in Formosa, who has placed many contributing *Chrysozephyrus* materials at our disposal. Most grateful thanks are also due to Mr. James R. Neidhoefer at Milwaukee in U. S. A. and Mr. S. K. Ong at Peitou in Formosa for their supreme support of our preparation for manuscript.

***Chrysozephyrus neidhoeferi* sp. nov.** ニシキミドリシジミ (新種, 新称)

Holotype ♀ (B-form) Middle Formosa, 1969, Length of forewing, 16 mm. (Figs. 1 & 2)
Paratypes 1♂ L. F. 16 mm. (Fig. 3) 2♀♀ (AB-form) L. F. 17-17.5. All in Middle Formosa, 1969, (Fig. 5). In T. Shimonoya's Collection.

Very much allied to *Chrysozephyrus kabrua niitakanus* Kano, but differs from it in many conspicuous characters as below :

Although the detailed data are unknown, it is certainly presumed that the new species occurs mixed with *C. kabrua niitakanus* and *C. esakii* in the same area, according to the envelope of these species in the same papers which were left on the collecting scene. From the envelope of the fresh *C. niitakanus* ♂♀ and worn examples of the new species together in the same papers, we conjecture the earlier emergency of the new species than that of *C. niitakanus*.

♂ Upperside forewing : Ground colour brilliant metallic golden green, black border extremely narrow, fringe in spaces 1-7 greyish white.

Upperside hindwing : Ground colour as forewing, black border much narrow as forewing, but widening remarkably in space 1b. Inwardly of black border in space 6 and in black border of spaces 1-2, brilliant whitish violet blue lineal scales are scattered. Tail long, brownish black, white-tipped.

Underside forewing : Ground colour greyish white mixed light brown, postdiscal white narrow line in spaces 2-7 inwardly edged with broad brownish scales, discocellular bar brown, edged with white narrow lines on both sides. Submarginal light brownish broad line becoming narrower gradually towards apex and a half disappeared near apex.

Underside hindwing : Ground colour as forewing, postdiscal white narrow line being slightly near outer margin, inwardly edged with light brownish scales, and becoming the complete W-shaped mark

near tornus. Discocellular bar brown, being parallel with white narrow line. Light brownish streak near the base of space 7 appearing faintly. Black pupilled yellowish orange ellipse ocellus at anal angle, violet blue scales scattered in outer margin of spaces 1-2. Submarginal greyish white pepper-and-salt band not so conspicuous.

Male genitalia (Fig. 10). Closely allied to *C. kabrua niitakanus*, but valva somewhat broader, bill-shaped projection a little longer and thicker. Elbow-shaped part of brachium projects in triangular, and has many minute thorns.

We expect the detailed researches after more fresh materials (especially male) will be obtained.

♀ There are two forms in female. Upperside forewing: In AB-form, ground colour brownish black, but light greyish brown at basal half of costal margin, golden green mark with bluish reflection in space 1 b as well as discoidal cell, and at the base of spaces 2-3, purpulish mark mixed brilliant violet blue scales at the base of spaces 1 a and 4. Outwardly of golden green mark in spaces 1 b, 2 and 3, edged with purplish scales, ellipse mark at the base of space 3 light yellowish orange.

In B-form, as in AB-form, except for disappearance of yellowish orange ellipse mark at the base of space 3.

Fig. 10. Male genitalia of *Chrysozephyrus neidhoeferi* sp. nov. and *Chrysozephyrus kabrua niitakanus* Kano.
A : *C. neidhoeferi* sp. nov ; B : *C. kabrua niitakanus* Kano ; A-1 : Left-hand valva, outer aspect. A-2 : Ditto, inner aspect. B-1 : Left-hand valva, outer aspect. B-2 : Ditto, inner aspect.

Upperside hindwing : Ground colour lighter brownish black than forewing and becomes more deep from base towards outer margin. Golden green and violet blue scales scattered slightly in the central area of discoidal cell, also in space 2 in case of an example. Whitish violet blue lineal scales in outer margin extends from space 1 to space 6, but vanishes in spaces 4-5 in case of a few examples. Tail brownish black, long (4 mm.) and with white tip.

Uuderside : Both wings as in male. In a few examples, outward area of postdiscal white narrow line becomes broadly whitish tone, so the line indistinct.

The new species differs from *C. kabrua niitakanus* in the following points :

1) Smaller size (16-17 mm.) than *C. niitakanus* (18-20 mm.) in both sexes.
2) Upperside of male, black border remarkably narrower and the same width in both wings, but in *C. niitakanus* black border of hindwing broader than the same of forewing.
3) Golden green mark on upperside of forewing in female is light sky blue in female of *C. niitakanus*. This difference is the most important character in the new species.
4) Outer marginal violet blue lineal scales of hindwing on upperside in female well developed and appearing also in space 6, but much scarcely in this space in *C. niitakanus*.
5) The yellowish orange mark in space 3 of the AB-form in female deeper and more remarkable than *C. niitakanus*.

Chrysozephyrus muhshengi **sp. nov.** モクセイミドリシジミ (新種, 新称)

Holotype ♂ Prov. Nantou, Formosa, June, 1969. Length of forewing 22 mm. (Figs. 8 & 9)
Paratype 1♂ Mt. Rara, Formosa, June, 1970.
In T. Shimonoya's Collection.

The new species is closely similar to *Chrysozephyrus disparatus pseudotaiwanus* Howarth in its appearance as well as the male genitalia.

♂ Upperside forewing: Ground colour somewhat yellowish golden green and reflects bluish green. Black border ca. 1 mm., in breadth widens gradually to 1.3 mm. towards apex, fringe black and white-tipped.

Upperside hindwing: Ground colour as in forewing. Outer marginal black border 1.5 mm., in average breadth, however 2 mm. in spaces 1 b-2. The space 6 black except for a part of base. Violet blue lineal scales inwardly of fringe of outer margin in spaces 1 b-2 at anal angle. Fringe black and long, white-tipped, but the spaces 1-2 black inwardly as well as outwardly and white in the middle part. Tail black with white tip (5.5 mm.).

Underside forewing: Ground colour light greyish brown with a little dark feeling, and darker in outer half area. Outer marginal fringe shaded inwardly with narrow blackish brown streak, inwardly of which distinct white narrow line runs, also in spaces 3-8 of submarginal area presents white streak. Submarginal black markings in spaces 1 b-3 are connected with each other and extend narrower from space 3 towards apex, white band runs parallel outwardly with submarginal black markings. Discocellular bar light brown.

Underside hindwing: Ground colour, narrow blackish brown streak inwardly of outer marginal fringe, and distinct white narrow line inwardly of this streak as in forewing. Submarginal straight white line from anal angle towards costal margin runs parallel with outer margin in spaces 3-5, becomes incomplete W-shaped mark, and is broken on the vein 2 (Cu_2). The W-shaped mark in spaces 1-2, is lined inwardly with black streak of the same breadth with this mark. Orange marking at anal angle in spaces 1-2 is cut in three on the veins, the half part of space 1 b near space 2 disappeared. Black pupilled orange ellipse ocellus in space 2 large, anal angle black-tipped. Both sides of orange ocellus in spaces 1-2 at anal angle scattered brilliant violet blue lineal scales, but the
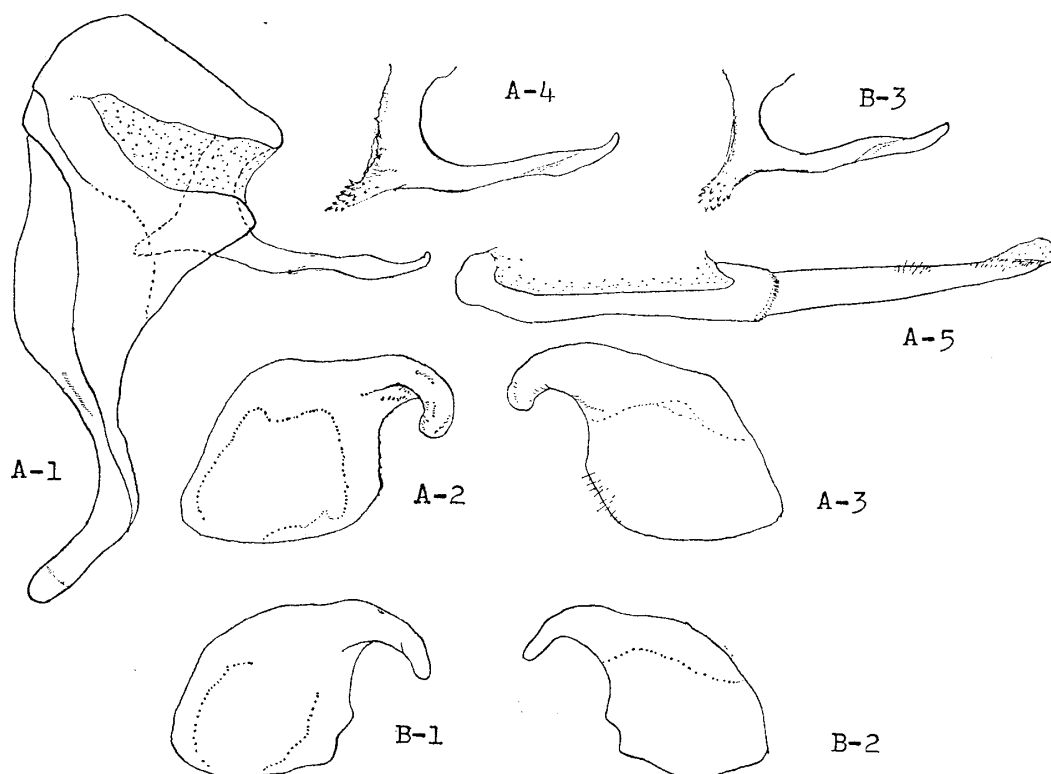
Fig. 11. Male genitalia of *Chrysozephyrus muhshengi* sp. nov. and *Chrysozephyrus disparatus pseudotaiwanus* Howarth.
A: *C. muhshengi* sp. nov; B: *C. disparatus pseudotaiwanus* Howarth; A-1: Lateral aspect of ring. A-2: Left-hand valva, inner aspect. A-3: Ditto, outer aspect. A-4: Left-hand brachium, outer aspect. A-5: Lateral aspect of phallus. B-1: Left-hand valva, inner aspect. B-2: Ditto, outer aspect. B-3: Left-hand brachium, outer aspect.

scales lacking only inwardly of space 1 a. Submarginal band of whitish puppet and salt scales in spaces 3-6 waves inwardly. Long tuft in inner margin greyish white, discocellular bar greyish brown, narrow bar in the central area of space 1 white.

Thorax and abdomen covered with long brownish hairs, those of dorsal thorax and abdomen reflects darkish golden green, ventral thorax covered with long whitish hairs.

Male genitalia (Fig. 11). Differs from *C. disparatus pseudotaiwanus* HOWARTH in the following points. Brachium: Small projection with many minute thorns in the elbow-shaped bending part of brachium not extended in tip and not well developed as in *C. disparatus pseudotaiwanus*. Upper section of brachium is thicker than in *C. disparatus pseudotaiwanus*.

Valva: Larger in size, long extending projection in upper section more strongly bending like a hook, tip of this projection expanded more thickly.

Different points of the male from *C. disparatus pseudotaiwanus* in appearance.

1) Fringe of hindwing longer and that of spaces 3-6, inwardly blackish brown, outwardly white. In *pseudotaiwanus*, mixed with white and greyish white.
2) Upperside, black border much broader, especially in hindwing ca. 1.5 times as broad as *pseudotaiwanus*, but equal to width of *C. rarasanus*.
3) Violet blue lineal scales being parallel with submarginal area at anal angle on upperside of hindwing is more remarkable.
4) Ground colour of underside light brown, but in *pseudotaiwanus* greyish brown with whitish tone. This character is very important different point.
5) Postdiscal white line of both wings on underside more narrow and straight. W-shaped mark incomplete, on the contrary, in *pseudotaiwanus*, white line thick, somewhat zigzag, W-shaped mark almost complete. Postdiscal white line runs a little near outer margin in *pseudotaiwanus*, but near centre area in the new species.
6) Larger size (Length of forewing 22mm.). Even largest example of *pseudotaiwanus* not larger than 20 mm.
7) Orange ocellus at anal angle on underside of hindwing more deep reddish tone.

In future, we expect more detailed examination about the taxonomic relation between *C. disparatus pseudotaiwanus* and the new species.

要　　約

本稿で我々は，台湾産 *Chrysozephyrus* 属ミドリシジミの２新種を記載する．

これらの貴重な研究材料は全て，余清金氏（台湾，埔里）の御提供によるもので，その功績を称えると共に厚く御礼申し上げる．

また，本稿を作成するに際し，多大なる御援助を賜った James R. Neidhoefer 氏 (Milwaukee, U.S.A.), 並に王生鏗氏（台湾，新北投）に深く感謝の意を表する．

Chrysozephyrus neidhoeferi sp. nov. ニシキミドリシジミ（新種，新称）

Holotype ♀（B型），台湾中部，1969，前翅長 16 mm. (Figs. 1, 2)

Paratypes 1♂，台湾中部，1969，前翅長 16 mm. (Fig. 3) 2♀♀（AB型），台湾中部，1969，前翅長 17～17.5 mm. (Fig. 5).

本新種は台湾にも産する *Chrysozephyrus kabrua niitakanns* Kano カノミドリシジミに最も近似のもので外観や，♂の交尾器など酷似するが，♀の前翅表面が金緑色を呈することになど，極めて特異なものである．

本種と *niitakanus* とは混棲しており，また，発生期は本種の方が早いようである．

C. kabrua niitakanus カノミドリシジミとは，次の様な点で区別できる．

1) ♂♀とも *niitakanus* より小型で，前翅長 16 mm～17 mm が普通の大きさである．

2) ♂の表面外縁の黒色帯が著しく細く，前後翅ともほぼ同じ幅であるが，*niitakanus* では後翅の方がやや幅広い．
3) ♀の前翅表面に金緑色鱗を有すること，*niitakanus* の♀では明るい空色（コバルト・ブルー）で，この点は両種を区別する上で最も顕著な特徴である．
4) ♀の後翅表面外縁の青藍色線状鱗がよく発達していること．*niitakanus* では，第1，2室にのみ認められるのが普通で，個体によって稀に第6室に表れているものもあるが，その程度は本種ほどではない．本種においては発達の悪い個体でも第1～3室，第6室の各室に認められ，第1～6室まで連続しているものもある．
5) ♀のＡＢ型のものの前翅表面第3室の黄橙色斑は，本種の方がより強く表れ，色調も濃い．

Chrysozephyrus muhshengi sp. nov. モクセイミドリシジミ（新種，新称）

Holotype ♂，台湾省南投県，June, 1969，前翅長 22 mm，(Figs. 8, 9)
Paratype 1♂，ララ山，June, 1970，前翅長 22 mm.

本新種は外観および♂の交尾器などにより，シッキム，アッサム，中国雲南省および台湾に分布する *Chrysozephyrus disparatus* HOWARTH タイワンミドリに最も近縁のものと考えられる．♀は未知であるが，♂は台湾に産する *disparatus* の亜種とされる ssp. *pseudotaiwanus* タイワンミドリと次のような点で区別できる．

1) 表面外縁部の黒色帯は，本種の方が前後翅ともはるかに幅広く，特に後翅においてはその差が著しい．後翅では *Chrysozephyrus rarasanus* MATSUMURA ララサンミドリ♂のそれに等しい．
2) 後翅表面肛角部の亜外縁沿いの青藍色線状鱗は，本種の方がより強く表れている．
3) 後翅の縁毛は，本種の方が長く第3～6室のものは，*psendotaiwanus* では白色毛と灰白色毛が混生しているが，本種では基部が黒褐色，先端が白色に2分されている．
4) 裏面地色は，*pseudotaiwanus* では白色味の強い灰褐色で赤色味が乏しく，全体的に白っぽく見えるが，本種では地色が淡褐色でその差は一見して区別できる程，顕著なものである．
5) 前翅裏面の白色条の位置が *pseudotaiwanus* では外縁に近いが，本種では翅の中央に寄っている．また，裏面前後翅の白色条は，*pseudotaiwanus* においては形状，太さに変化があり，区別する上ではあまり役立たないが，本種では直線状で後翅肛角部のＷ字状部が不完全，*pseudotaiwanus* では幾分ジグザグに曲っており，Ｗ字状部も完全に近い．
6) 本種の方が大型である．本種では前翅長 22 mm であるが，*pseudotaiwanus* では 18～20 mm である．
7) 後翅裏面肛角部の橙色斑が本種の方が赤味が強い．
8) ♂の交尾器も *pseudotaiwanus* に似るが，valva 等の形状が異っている (Fig. 11).

なお，カラープレートは都合により本誌印刷所の秀巧社で印刷したものではなく，そのため図版の一部分が実際と異った色に印刷されている個所があるので，以下の点について留意されて御覧願いたい．

Fig. 1. *C. neidhoeferi* ニシキミドリシジミ♀の前翅表面の金緑色部が，写真では空色になっている．また，Fig. 6. *C. disparatus pseudotaiwanus* タイワンミドリ♂と Fig. 8. *C. muhshengi* モクセイミドリシジミ♂の表面の地色が実際より青味が強くなっている．実際はもっと黄色味を帯びた金緑色である．

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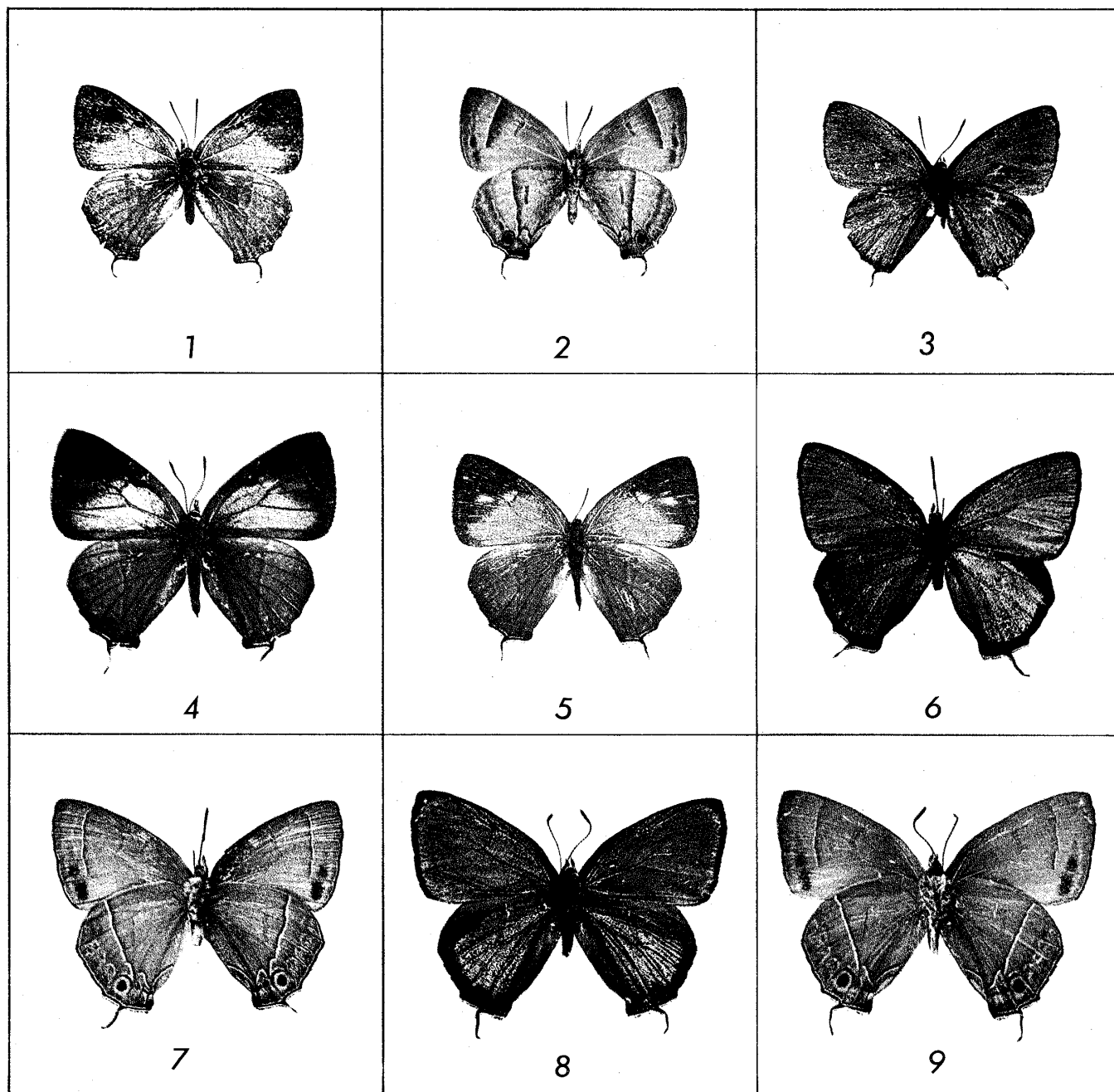
Fig. 1	ニシキミドリシジミ	♀ (B型)	(*Chrysozephyrus neidhoeferi* sp. nov. ♀ Holotype)
Fig. 2	ニシキミドリシジミ	裏面	(Ditto Underside)
Fig. 3	ニシキミドリシジミ	♂	(*Chrysozephyrus neidhoeferi* sp. nov. ♂ Allotype)
Fig. 4	カノミドリシジミ	♀	(*Chrysozephyrus* kabrua niitakanus Kano ♀)
Fig. 5	ニシキミドリシジミ	♀ (AB型)	(*Chrysozephyrus neidhoeferi* sp. nov. ♀ Paratopotype)
Fig. 6	タイワンミドリシジミ	♂	(*Chysozephyrus disparatus pseudotaiwanus* Howarth ♂)
Fig. 7	タイワンミドリシジミ	裏面	(Ditto Underside)
Fig. 8	モクセイミドリシジミ	♂	(*Chysozephyrus muhshengi* sp. nov. ♂ Holotype)
Fig. 9	モクセイミドリシジミ	裏面	(Ditto Underside)